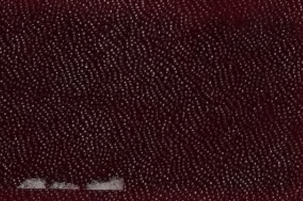

Rada-Sweep Sr.

ISSUE B

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Rada-Sweep Sr.

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Fig. 1-1, Rada-Sweep Sr.

SECTION I
GENERAL INFORMATION

I-1 INTRODUCTION.

The RADA-SWEEP SR. is a wide-range, all-electronic sweeping oscillator, with center frequencies and marker frequencies furnished as specified by the customer. Center frequencies between 1 and 260 mc can be furnished, with the swept frequency spectrum covered in six switched bands. Fundamental frequency operation on all bands assures stable operation, free of spurious outputs.

A wide range of pulse-type, crystal-controlled frequency markers can be furnished. These are automatically switched in the circuit singly or in groups of two or more for each band setting.

Sweeps produced are ideal for sweeping i-f and r-f circuits. Fast-acting agc circuits and an electronically-regulated power supply insure a high degree of stability and accuracy. When used in conjunction with an oscilloscope, visual representation of the frequency response characteristic of the circuit being tested is available.

The RADA-SWEEP SR. is functionally designed with a minimum of controls, making its use as a production-line tool entirely feasible. Rugged construction, judicious shielding and incorporation of advanced engineering techniques, make the RADA-SWEEP SR. a truly reliable and accurate instrument.

I-2 FEATURES.

Variable permeability techniques are used to generate flat frequency sweeps, with center frequencies set at any six designated frequencies (within the 1 to 260 mc range). Sweep width is at least 70% of center frequency up to 100 mc and 60 to 70 mc from 100 to 260 mc (or as specified). For narrow-band work the sweep width on each band is variable down to a small percentage of maximum.

A single, manually operated band-selector switch permits selection of the desired frequency sweep and markers for that band. The markers for each band can be fed directly to the vertical input of the scope (marker bypass system), or internally imposed on the r-f output. When fed directly to the scope, markers are completely independent of the circuit under test and neither overload the circuit, or disappear in traps or regions of low amplification. Marker amplitude is continuously variable from zero to approximately 10 volts peak.

A linear sawtooth voltage is generated and made available at a panel jack for horizontal deflection of the scope trace. Since the sweeping oscillator is synchronized with the sawtooth sweep, the swept frequency is proportional to the sawtooth making phasing controls unnecessary. The sweeping oscillator circuits are blanked during retrace time providing a true zero-level baseline. The sawtooth is generated at 60 cps line-frequency, but can be varied around this frequency for hum detection and other special tests.

Precision stepped attenuation of 3, 6, 10, 20 and 20 db can be inserted ahead of the RF OUTPUT terminal, permitting accurate amplitude calibration of the scope display. RF output level is held constant from band to band by the agc circuits.

1-3 SPECIFICATIONS.

FREQUENCY RANGE: 6 switched bands, with center frequencies between 1 and 260 mc; as specified by the customer.

SWEEP WIDTH: 70% of center frequencies selected between 1 and 100 mc, 60 to 70 mc for frequencies between 100 and 260 mc.

SWEEP RATE: Variable around 60 cps; locks to line frequency.

RF OUTPUT: 0.5 volt rms into nominal 50, 70 or 90 ohms, as specified. Output held within ±0.5 db over widest sweep.

ZERO REFERENCE: A true zero-level baseline produced on scope during retrace time.

ATTENUATORS: Switched 3 db, 6 db, 10 db, 20 db, 20 db; plus a continuously variable 6-db increment.

MARKERS: Up to 24 crystal-controlled, positive pulse-type markers (at frequencies as specified), can be switched in groups. Markers are accurate to ±0.05% and are continuously variable in amplitude from zero to approx. 10 volts peak.

SWEEP OUTPUT: Regular sawtooth synchronized with sweeping oscillator. Amplitude approx. 7.0 volts peak.

POWER INPUT: 117 volts (±10%), 50-60 cycles a-c.

DIMENSIONS: 19½" x 9-1/8" x 13"

WEIGHT: 34 lbs.

1-4 EQUIPMENT SUPPLIED.

The standard RADA-SWEEP SR. is mounted in a blue-gray, baked enamel cabinet and is shipped complete with built-in power supply. Other auxiliary equipment and interconnecting cables referred to in this manual are not furnished.

SECTION II
INSTALLATION

2-1 GENERAL INSTRUCTIONS.

As soon as the RADA-SWEEP SR. is received, it should be visually inspected to determine that the instrument was not damaged during shipment. A careful check of packing case contents should be made to insure removal of all items shipped. Shortage, or damage should be reported immediately to the carrier and Kay Electric Company, or the Kay representative in your area.

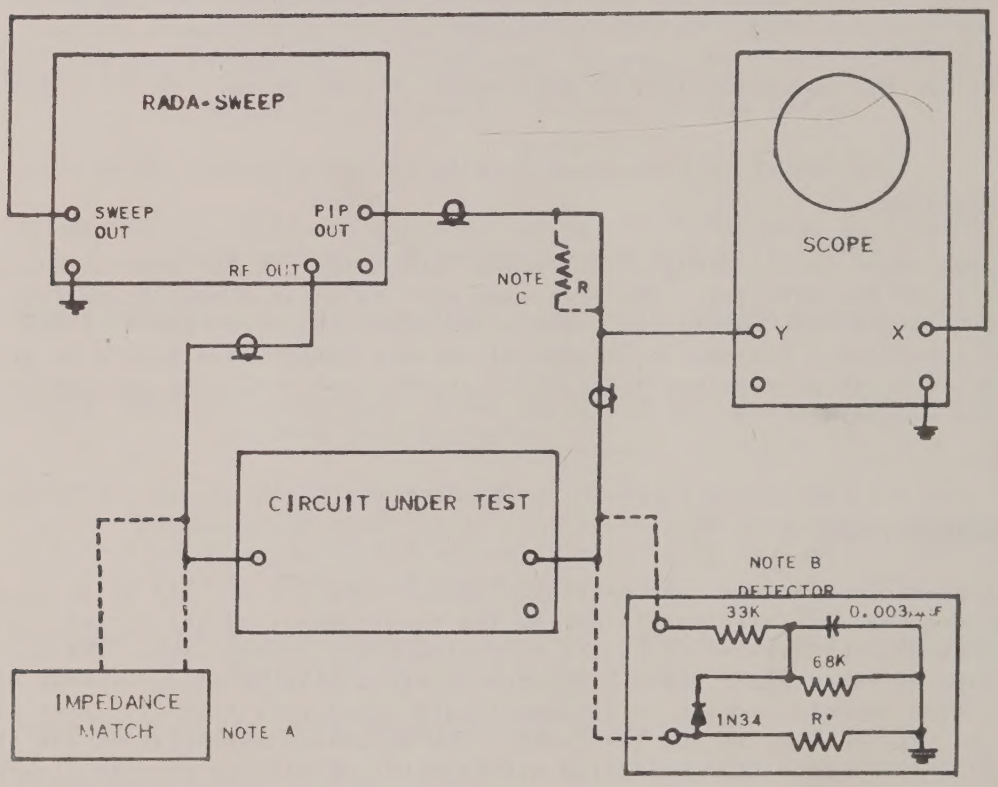
2-2 INSTALLATION.

The RADA-SWEEP SR. is designed for either bench top use (or rack mounting, after removal of the cabinet). The operating area selected should be as free as possible from vibration, due to the presence of operating machinery or other sources of vibration. Extreme variations of ambient temperature should be avoided. Observation of these precautions will result in the user realizing optimum performance of the equipment.

2-3 INTERCONNECTIONS.

Interconnections between the RADA-SWEEP SR., scope and circuit to be tested will be determined, at least partially, by the requirements of the circuit under test. Figure 2-1 illustrates the basic inter-equipment connections. The use of coaxial cable is recommended where indicated to avoid pick-up of extraneous signals. All leads should be kept to minimum length consistent with placement of equipment on the bench or in the test rack. The impedance matching pad and the external detector should be constructed within metal shields to prevent pickup of spurious signals. The resistor referenced in Note C should be physically located as close as possible to the Y-input terminals on the scope.

Specific instructions for making input and output connections to the test circuit are not included in these instructions. Such instructions would require specific reference to the numerous circuits that can be tested. Additional information on this subject can be gathered from the many books and references available. However, the importance of proper impedance match between the equipment cannot be over emphasized. If the input impedance of the circuit under test is substantially different than the output impedance of the RADA-SWEEP SR., an impedance matching device is required as shown in Fig. 2-1. The impedance matching resistor (R*) in the external detector circuit, should be of such value to match the output impedance of the circuit under test.



NOTES:

A. IF INPUT IMPEDANCE OF CIRCUIT UNDER TEST DIFFERS FROM OUTPUT IMPEDANCE OF RADA-SWEEP, IMPEDANCE MATCHING DEVICE SHOULD BE USED.

B. IF CIRCUIT UNDER TEST DOES NOT INCLUDE A DETECTOR, EXTERNAL DETECTOR SHOWN IS RECOMMENDED.

C. RESISTOR SHOWN IN NOTE C SHOULD BE USED IF MARKERS ALTER SHAPE OF SCOPE PATTERN. R IS 47K, ½W NONINDUCTIVE RESISTOR.

R* SEE TEXT

Figure 2-1, Equipment Interconnections.

SECTION III
FUNCTION OF CONTROLS AND TERMINALS

3-1 FRONT-OF-PANEL CONTROLS.

CONTROL	POSITION	FUNCTION
POWER ON-OFF Switch S-1	ON	This is a toggle-type switch located below the main tuning dial and controls a-c power input to the instrument. When this switch is in the ON position, transformer T-501 is energized, furnishing filament voltage to all tubes and B+ to the circuitry.
	OFF	When S-1 is in the OFF position the instrument is completely de-energized.
BAND SELECTOR Switch S-2	6 positions	The BAND SELECTOR is rotatable both clockwise and counterclockwise, and is used to select the swept ranges.
CENTER FREQUENCY ADJ. pot R-26	Variable	This is the center concentric control of the Band Selector and provides center-frequency adjustment of the swept rf.
SWEEP RATE Pot. R-2	Variable	The SWEEP RATE control provides a means of synchronizing the sweep generator with line frequency, or of varying the rate around this frequency for hum measurements and other special tests.
SWEEP WIDTH Pot. R-14	Variable	The amount of frequency deviation of the r-f output can be varied by adjusting this control.
PIP ADJ Pot. R-99	Variable	Adjustment of the average trigger amplitude at the input grid of the 2nd Trigger Amplifier V-9 is provided by this control.
PIP LEVEL Pot. R-120	Variable	The PIP LEVEL pot controls the amplitude of the marker pips at J-3; it does not effect the amplitude of the internal pips.
INT PIP - OFF Switch S-8	INT PIP	Markers are imposed internally on the swept rf when S-8 is set to the INT PIP position.
	OFF	When S-8 is in the OFF position, marker pips are removed from the swept r-f output.

CONTROL	POSITION	FUNCTION
Attenuator Switches S-3 thru S-7	Stepped	Individual switches permit insertion of attenuation in steps of 3 db, 6 db, 10 db, 20 db and 20 db ahead of the RF OUTPUT jack J-2.
RF LEVEL Pot. R-59	Variable	This control provides a 6-db variable increment of attenuation in addition to the stepped attenuation.

3-2 FRONT-OF-PANEL TERMINALS.

TERMINAL	FUNCTION
SWEEP OUTPUT Jack J-1	These are universal-type binding posts from which the sawtooth voltage is obtained to drive the X-axis amplifier of the CRO.
RF OUTPUT Jack J-2	This is a BNC-type terminal from which the swept rf is obtained.
PIP OUTPUT Jack J-3	These are universal-type binding posts from which marker pips are available for application to the Y-input terminals on the CRO.

3-3 INTERNAL CONTROLS.

This listing references only those internal controls requiring adjustment during normal servicing of the instrument. Function of variable components used for alignment of the several circuits is covered in Section VI, Maintenance.

CONTROL	POSITION	FUNCTION
LIN ADJ Pot. R-22	Variable	The Linearity Adjust control is located on the left side-flange of the chassis and is used to establish the conduction point of diode D-6.
PIP ADJ Pot. R-114	Variable	This control is located on the right side-flange of the chassis and is used to establish the firing point of Pip Generator V-10.
B+ ADJ Pot. R-512	Variable	The B+ ADJ pot is located on the rear of the chassis and should be adjusted to provide 250 volts as measured between the junction of C-506, R-514 and chassis ground.
PIP POLARITY Switch S-9	NEG - POS	This switch is located on the right side-flange of the chassis and is used to determine the polarity of the marker pips.

SECTION IV
OPERATION

4-1 GENERAL DISCUSSION.

It is assumed the RADA-SWEEP SR. and associated equipment have been interconnected as shown in Fig. 2-1. Incorporation of the impedance matching device and external detector in the test set-up will depend on the requirements of the circuit being tested. It is important that interconnecting cables be correctly terminated to provide proper impedance match at the equipment input and output terminals. The equipment should be turned on and allowed a warm-up of 10 to 15 minutes to stabilize the circuits.

4-2 INITIAL ADJUSTMENT OF FRONT-OF-PANEL CONTROLS.

a. Set the Band Selector switch to the desired center frequency.

b. Adjust the scope controls for an on-screen scope display. The scope sweep is not used; set scope X-axis controls for X-axis amplifier operation. Adjust scope Y-axis input attenuator and gain control for on-screen vertical deflection.

c. Now adjust the Sweep Rate control for stable pattern (sawtooth synchronized with line frequency). Non-synchronization is indicated by horizontal wavering of the pattern.

d. Next, adjust the Sweep Width and Center-Frequency controls for desired sweep width and centering.

e. Finally, adjust the RF Level control and insert attenuation, if necessary, for desired vertical deflection of the CRO trace.

Care should be taken to avoid overloading the amplifiers with too high an r-f input. An amplifier is operating below overload when the insertion of additional attenuation in the r-f output changes only the amplitude of the amplifier output and not the shape and amplitude of the output.

f. Frequency marker pips can be internally imposed on the swept rf, or externally applied directly to the Y-input terminals on the CRO; depending on the setting of the INT PIP - OFF switch S-8. If pips are to be applied externally (marker bypass system), set the INT PIP - OFF switch to the OFF position. Now, provide a connection between the PIP OUTPUT jack J-3 and the Y-input terminals on the CRO, using the isolating resistor shown in Note C, Fig. 2-1. Set the PIP LEVEL control to mid-range and vary the PIP ADJ control until pips appear on the scope trace. Then readjust the PIP LEVEL control for the desired marker amplitude. The PIP ADJ control may require readjustment to bring the full complement of pips on screen.

g. When frequency markers are internally imposed on the swept rf (S-8 in INT PIP position), the connecting cable between the PIP OUTPUT terminals J-3 and the Y-axis input on the CRO is not required. PIP LEVEL control R-120 does not effect the internal pips.

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SECTION V
CIRCUIT DESCRIPTION

5-1 INTRODUCTION.

This section is devoted to a discussion and analysis of the RADA-SWEEP SR. circuits. While a working knowledge of the circuitry is not essential to operate the instrument, this technical information is useful to the service technician and the discriminating user desiring to exploit the instrument's versatility to the fullest extent.

5-2 OVERALL CIRCUIT DESCRIPTION.

A functional block disgram showing the relationship and function of the individual circuits is furnished in Fig. 5-1. The description of the RADA-SWEEP SR. circuitry begins with the sweep generator V-1, where voltages are generated to frequency modulate the sweeping oscillator V-3, V-4, blank the oscillator during retrace and drive the scope X-axis amplifier.

A- Sweep Generator (V-1).

A type 6J6 dual triode (V-1) is employed in a plate-coupled, astable multivibrator circuit, to generate a train of square waves at power-line frequency. Synchronization at 60 cps is accomplished by coupling one grid of the 6J6 to its own filament circuit. SWEEP RATE control R-2 provides a means of varying the rep-rate around this frequency by changing the d-c grid bias on the multivibrator.

The square-wave output is passed through a shaping network (R-6, R-11, C-6, C-7) which converts it into a regular sawtooth voltage. This sawtooth voltage is available at the SWEEP OUTPUT terminals J-1. The sawtooth voltage is also coupled to the sawtooth amplifier V-2 through switch section S-2C. As the Band Selector is switched from band to band, section S-2C inserts resistors to establish proper sweep width. Center Frequency Adj (R-26) provides a small adjustment of the center frequency. The square-wave output of V-1 is also coupled to diode D-3 where the positive-going portion is clipped. The resultant negative voltage is used to blank the sweeping oscillator tubes (V-3, V-4) during retrace time, providing a zero-level baseline on the scope.

B- Sawtooth Amplifier (V-2).

Plate potential for the sawtooth amplifier (V-2) is supplied through the series-connected control winding (L-1) of the sweep yoke. Current flow through V-2 will vary with the sawtooth voltage on its grid. The resultant varying current flowing through L-1 varies the inductance of the sweeping oscillator tank coils L-2A, L-3A, etc.; and the frequency of the oscillator.

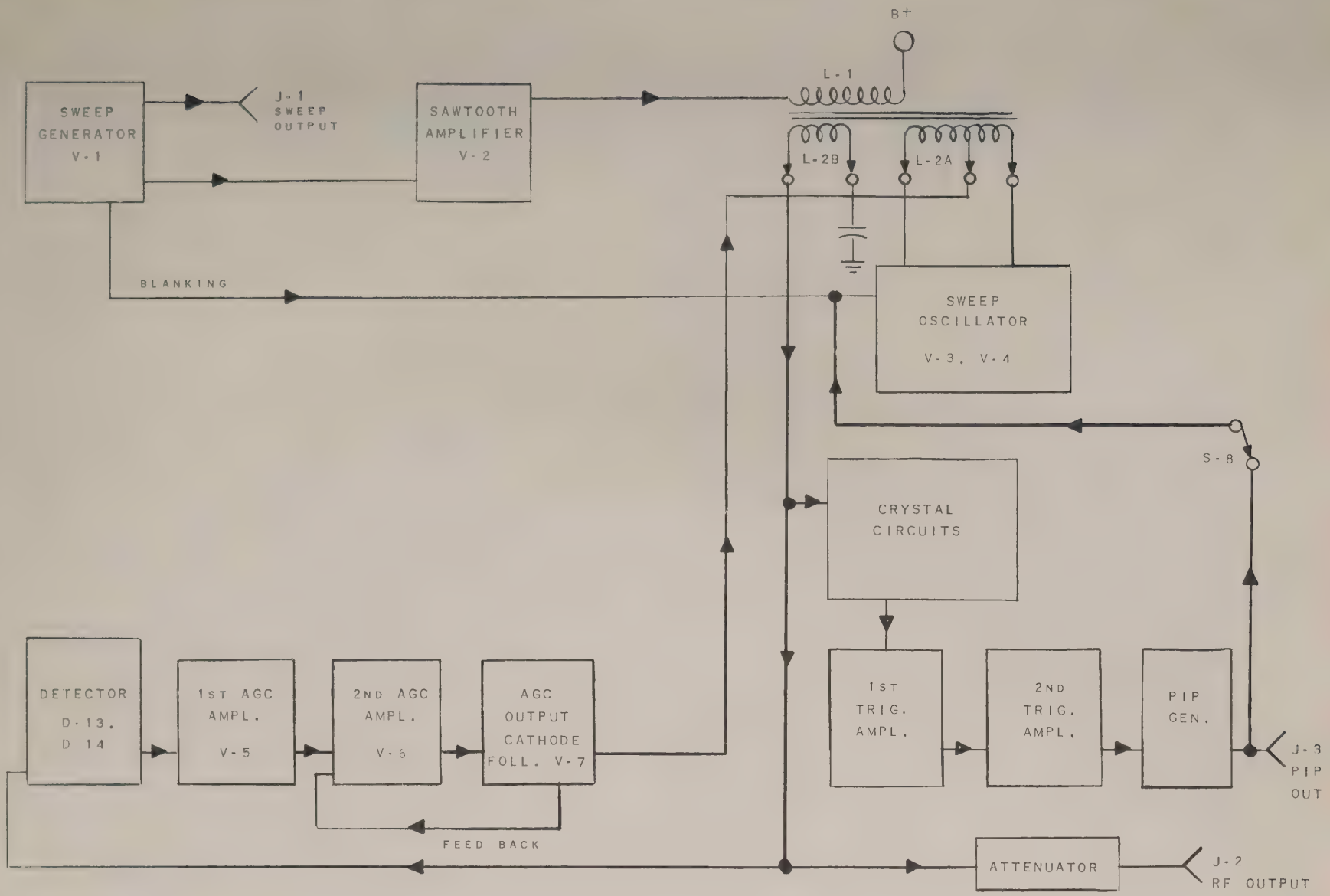


Fig. 5-1, Functional Block Diagram, Rada-Sweep Sr.

The sawtooth amplifier would function as a regular pentode amplifier except for diodes D-4, D-5 and D-6 in its cathode circuit. Since the nonlinear saturation characteristics of the ferrites would cause nonlinear frequency deviation of the r-f oscillator, if the control winding of the sweep yoke were driven by a linear sawtooth signal, the diodes are used to purposefully produce nonlinear gain in V-2 as it drives the sweep yoke through each cycle. This counteraction enables the oscillators to produce linear frequency sweeps on all bands.

The sweep yoke is an electromagnetic control device which frequency modulates the sweeping oscillator (V-3, V-4) by changing the inductance of the tank coils L-2A, L-3A, etc. The yoke consists of a control winding wound on a C-shaped, laminated iron core. The C-shaped core straddles or "yokes" the turret holding the oscillator tank coils, which are wound on ferrite rods. The mechanical arrangement of the yoke and turret is such that at each band position a ferrite rod is positioned in the open side of the yoke and completes its magnetic circuit.

Current through the control winding of the yoke produces a magnetic field in the core and the ferrite rod. The magnetic field through the ferrite reduces its permeability and therefore, the inductance of the coil wound on it (inductance being a direct function of the permeability). Reducing the tank coil inductance raises the r-f oscillator frequency. Current through the control winding is the plate current of V-2, the sawtooth amplifier. This current is "swung" by the sawtooth voltage applied to the grid of V-2 to sweep the r-f oscillator.

C- Sweeping Oscillator (V-3, V-4).

Two type 5718 sub-miniature triodes V-3, V-4 are used in a grounded cathode, balanced push-pull oscillator circuit, to generate frequency sweeps with center frequencies selectable between 1 and 260 mc. Center frequency for each band setting is determined by the inductance of the sweep yoke secondary switched in the circuit and the stray capacitances in the circuit. The repetition rate of the frequency sweeps is that of the sweep generator V-1. As the current through the sweep yoke L-1 varies with the sawtooth voltage applied to the grid of V-2, the inductance of the oscillator tank coil in the circuit varies. Thus, the oscillator undergoes a change in frequency, over the limits set by the sweep width control R-14. The oscillators are blanked during the flyback period of the sawtooth voltage by the application of a negative blanking voltage to their grids. Oscillator output is coupled out through pick-off loops L-2B, L-3B, etc. Agc'd plate potential keeps the output constant from band to band.

D- Marker Generating Circuits.

To develop frequency marker pulses, part of the sweeping r-f signal from V-3, V-4 is coupled to the marker crystals. The marker crystals produce extremely sharp, narrow r-f pulses as the sweeping signal passes through their resonant frequencies. The r-f pulses are detected and fed to the trigger amplifiers V-8, V-9. (Since each marker frequency, and number of markers

is in accordance with the customer's specifications, specific component values for this portion of the circuit are not shown on the schematic, nor do they appear in the parts list.)

Two type 12AU7's V-8, V-9 operate as a four-stage cascade amplifier. The PIP ADJ control R-99 is connected between the output of the 1st trigger amplifier and the input to the 2nd stage, furnishing a panel control to establish the firing point of V-10. Correct adjustment of R-99 will cause V-10 to fire once for each marker trigger and prevent firing on spurious triggers (crystal harmonics). Also incorporated between the two stages is R-100, one half of the dual RF LEVEL control. The two sections of this potentiometer work in reverse of each other, i.e., when the RF LEVEL control is set for full output, R-100 is set for minimum output, or conversely, thus, maintaining the marker amplitude constant for any setting of the RF LEVEL control.

Diode D-15 in the section B grid of V-9 clips the negative portion of the trigger pulse. The remaining positive portion of the trigger is amplified in section B and then capacitively coupled to V-10, the pip generator tube. Here, a type 12AT7 operates as a one-shot multivibrator with section B normally biased to cutoff, due to the direct coupling between plate #1 and the section B grid. The negative pulse from V-9 triggers V-10 producing a marker at the PIP OUTPUT jack J-3.

Internal PIP ADJ control R-114 determines the firing point of V-10 by establishing its cathode bias. PIP LEVEL control R-120 furnishes a panel control for adjusting the pip amplitude at J-3. Markers can be imposed internally on the swept rf when S-8 is set to the INT PIP position. The sweep oscillator output is then notched by the positive marker pulses, producing frequency identification on the scope pattern.

E- AGC Circuits (V-5, V-6, V-7),

A sample of the r-f output is fed to two high-frequency diodes D-13 and D-14, which are used in a voltage-doubler detector circuit. The detected negative output voltage is fed to the agc amplifiers V-5, V-6.

The effective voltage on the grid of V-5 is the sum of the negative correction voltage derived from the detector, and the positive reference voltage derived from B^+ through the RF LEVEL control R-59, and its associated resistive network. The setting of the RF LEVEL control will determine the average grid bias for V-5 and eventually, the average plate voltage for the type 5718 tubes in the sweep oscillator.

The 2nd agc amplifier derives its grid bias by direct coupling to the plate of the input tube and further amplifies the correction voltage.

A type 6BK7 dual triode (V-7) is used in a cathode-follower agc output circuit, deriving its grid bias directly from the plate of V-6. Current flow through V-7 will follow the variations of the amplified correction voltage on the grids. The voltage developed at the cathodes is coupled to the center-tapped sweep yoke secondaries L-2A, L-3A, etc., furnishing plate potential to the sweeping oscillator (V-3, V-4). Amplitude variations of the sweep

oscillator output presents a higher, or lower, negative correction voltage to the grid circuit of V-5, reducing or increasing, the current flow through V-7. Since the voltage developed at the cathodes of V-7 is the plate potential for the sweeping oscillator tubes, the swept output is held steady across each sweep and from band to band.

The agc action is fast, preventing the r-f output from varying from the level established by the RF LEVEL control. Capacitor C-59 furnishes a means of adjusting the negative feedback from the cathode-follower output to the grid of the 2nd agc amplifier V-6. The feedback stabilizes the amplifier and prevents it from oscillating or "ringing".

F- Regulated Power Supply Circuits.

The voltage regulator circuits compensate for power-line voltage fluctuations or power-supply load changes. The regulator circuits sense these changes and respond electronically to maintain the output voltage constant.

Operation of the regulator circuit can be analyzed by considering a power-line fluctuation presenting a voltage rise at the primary of T-501. The voltage rise at the primary of T-501 will cause the power supply output voltage (the B+ voltage) to rise. This increase of B+ voltage increases the current through I-501 and I-502, thus raising the grid bias of V-505, permitting it to conduct more current and causing a corresponding drop in its plate voltage.

Since the plate of V-505 is tied directly to the grids of V-504, these are driven less positive, reducing the current flow through this tube and causing a drop in cathode potential across R-502, which lowers the voltage at the grids of V-502 and V-503. When these grids are made less positive, current through these tubes is decreased, causing a decrease in potential at their cathodes which furnish the regulated 250 volts B+ voltage.

Conversely, a power-line fluctuation presenting a lower voltage to the primary of T-501, will cause the regulating circuit to act in reverse of that for a higher voltage, as dealt with before. The regulating circuits also remove any residual ripple from the filter output. I-501, I-502 and capacitor C-505, see ripple as voltage changes and respond, as previously related, by presenting an opposite compensating voltage to maintain the output smooth and of constant amplitude. Changes of power-supply load are also reflected back to the regulator circuit and dealt with in similar fashion.

SECTION VI
MAINTENANCE

6-1 INTRODUCTION.

This section covers recommended procedures to locate circuit malfunction, alignment and adjustment instructions, and other service topics.

A routine check of electron tube performance and possible re-adjustment of internal controls, to insure accurate calibration of the circuits, should suffice to keep the RADA-SWEEP SR. in good operating condition. The frequency of such checks will depend on environmental conditions and length of usage. If operation of the instrument appears defective in any respect, first ascertain that the cause is not in the associated equipment, or in the interconnections between equipment. The most common cause of malfunction is due to weak or defective electron tubes, or diode failure. Trouble-shooting procedure will include testing the tubes for short circuit, open circuit, intermittent condition, microphonics, gassyness, or other signs of defectiveness. A reliable dynamic tube checker should be used for these checks. Substitution of a known good tube for a suspected defective one is also an acceptable procedure.

6-2 TROUBLE-SHOOTING SUGGESTIONS.

Trouble-shooting consists mainly of a process of elimination. The operator will seek to isolate the circuit and then the specific component(s) causing the malfunction. The use of an oscilloscope for signal tracing is recommended. Precautions should be taken to avoid loading-down the circuit being tested when taking voltage measurements, especially around the input grid circuits, and in the oscillator circuits. A vtvm is necessary to check bias voltages, and then, an isolating resistor in series with the probe is sometimes necessary. When signal tracing in the r-f sections of the circuitry, the use of a detector-probe is necessary.

Further assistance in trouble-shooting the equipment is furnished in the following listing of symptoms and possible causes.

SYMPTOM	POSSIBLE CAUSE
Loss of horizontal deflection on scope.	Check Sweep-Generator tube V-1 and immediate circuitry. When the sweep-generator stage is inoperative, horizontal deflection voltage for the scope is lost and Sweep Oscillator tubes V-3, V-4 are no longer frequency modulated.

SYMPTOM	POSSIBLE CAUSE
Loss of Sweep Width control and/or loss of Center Frequency control.	Check Sawtooth Amplifier V-2. If Sweep -Generator V-1 and Sweeping Oscillators V-3, V-4 are functioning, a baseline and possibly a response trace will be seen on the scope, but the Sweep Width and Center Frequency controls are ineffective.
Poor sweep linearity.	Check diodes D-4, D-5, D-6 and V-2. Check adjustment of the LINEARITY ADJ pot R-22. If adjustment of this control fails to correct nonlinearity, check the diodes and try another 6V6 in V-2 position.
No r-f output at J-2.	Check V-3, V-4 and agc circuit. An inoperative V-5 or agc output tube (V-7) will result in loss of plate potential at the 5718 oscillator tubes and loss of vertical deflection on the scope.
No baseline.	Check C-5 and D-3. Loss of blanking pulses at grids of V-3, V-4 could be caused by open C-5 or defective D-3.
No markers.	Check Trigger Amplifiers V-8, V-9 and Pip Generator V-10
Lack of RF LEVEL control.	Check V-5, V-6. A defective 6AU6 in V-5 position will result in reduced vertical amplitude (as seen on scope) and loss of RF LEVEL control. An increase in vertical amplitude accompanied by ineffective RF LEVEL control action indicates a defective 6AU6 in V-6 position, or trouble in associated circuitry.
General instability of scope trace, possibly accompanied by hum or ripple.	Check power supply section. Measure regulated B+ and readjust to 250 volts, if necessary. Check tubes and components in power supply.

TABLE 6-1, VOLTAGE MEASUREMENTS

NO.	TUBE	PIN #1	PIN #2	PIN #3	PIN #4	PIN #5	PIN #6	PIN #7	PIN #8	PIN #9
V-1	6J6	140	132	6.3VAC	6.3VAC	−23	−45	GROUND		
V-2	6AG7	10	6.3VAC	N.C.	6	10	125	6.3VAC	240	
V-3	5718	−12	N.C.	6.3VAC	N.C.	GROUND	6.3VAC	N.C.	132	
V-4	5718	−12	N.C.	6.3VAC	N.C.	GROUND	6.3VAC	N.C.	132	
V-5	6AU6	−.7	GROUND	6.3VAC	6.3VAC	20	10	GROUND		
V-6	6AU6	20	28	6.3VAC	6.3VAC	110	105	28		
V-7	6BK7	390	110	120	6.3VAC	6.3VAC	115	110	120	GROUND
V-8	12AU7	50	0	1.1	6.3VAC	6.3VAC	48	0	1.1	6.3VAC
V-9	12AU7	50	0	1.1	6.3VAC	6.3VAC	48	0	1.1	6.3VAC
V-10	12AT7	40	−.6	GROUND	6.3VAC	6.3VAC	260	30	60	6.3VAC
V-501	5Y3	N.C.	430	N.C.	380VAC	N.C.	380	N.C.	430	
V-502	6AQ5	265	270	6.3VAC	6.3VAC	400	400	N.C.		
V-503	6AQ5	265	270	6.3VAC	6.3VAC	400	400	N.C.		
V-504	12AU7	400	250	265	6.3VAC	6.3VAC	400	255	265	6.3VAC
V-505	6AG5	105	105	6.3VAC	6.3VAC	255	210	105		
V-506	OB2	N.C.	GROUND	N.C.	GROUND	105	N.C.	GROUND		

THE ABOVE READINGS WERE TAKEN WITH THE RF LEVEL CONTROL AND SWEEP RATE CONTROL TURNED FULLY CLOCKWISE.

TABLE 6-2, RESISTANCE MEASUREMENTS

NO.	TUBE	PIN #1	PIN #2	PIN #3	PIN #4	PIN #5	PIN #6	PIN #7	PIN #8	PIN #9
V-1	6J6	100 K	120 K	FIL.	FIL.	3.6 M	3.6 M	GROUND		
V-2	6AG7	2 K	FIL.	N.C.	450 K	2 K	13 K	FIL.	14 K	
V-3	5718	9.5 K	N.C.	FIL.	N.C.	GROUND	FIL.	N.C.	0	
V-4	5718	9.5 K	N.C.	FIL.	N.C.	GROUND	FIL.	N.C.	0	
V-5	6AU6	950 K	GROUND	FIL.	FIL.	3.3 M	15 K	GROUND		
V-6	6AU6	3.3 M	10 K	FIL.	FIL.	80 K	19 K	10 K		
V-7	6BK7	220 K	80 K	0	FIL.	FIL.	220 K	80 K	0	GROUND
V-8	12AU7	110 K	1.2 K	470	FIL.	FIL.	110 K	95 K	470	FIL.
V-9	12AU7	110 K	60 K	470	FIL.	FIL.	100 K	85 K	470	FIL.
V-10	12AT7	220 K	100 K	GROUND	FIL.	FIL.	47 K	1.4 M	12 K	FIL.
V-501	5Y3	N.C.	220 K	N.C.	160	N.C.	160	N.C.	220 K	
V-502	6AQ5	150 K	12 K	FIL.	FIL.	220 K	220 K	N.C.		
V-503	6AQ5	150 K	12 K	FIL.	FIL.	220 K	220 K	N.C.		
V-504	12AU7	220 K	550 K	150 K	FIL.	FIL.	220 K	550 K	150 K	FIL.
V-505	6AG5	200 K	19 K	FIL.	FIL.	550 K	15 K	19 K		
V-506	OB2	N.C.	GROUND	N.C.	GROUND	19 K	N.C.	GROUND		

SWEEP WIDTH CONTROL AND RF LEVEL POT TURNED FULLY CLOCKWISE.
THESE READINGS HOLD IF THE CAPACITORS IN THE CIRCUIT ARE FULLY DISCHARGED.

6-3 ALIGNMENT AND ADJUSTMENT.

Normal aging of components and tubes, plus prolonged operation of the instrument, may effect the performance. Should it become necessary to realign the instrument, it is recommended the following sequential procedures be adhered to. The accuracy of the alignment will depend on the accuracy of signal sources used, and precision of adjustments made during the alignment and adjustment procedure.

TEST EQUIPMENT REQUIRED.

(a) External Detector. (See Figure 6-1 for recommended circuit and construction details.)

(b) Oscilloscope.

(c) VTVM

(d) Two R-F signal-generators, one having a frequency range somewhat greater than the Rada-Sweep Sr., the other covering approximately 0.25 to 40 mc. One of the generators should be capable of at least 1-volt metered output.

(e) Interconnecting cables, T-connector, etc.

A. Sweep Linearity Adjustment.

Potentiometer R-22 provides a means of adjusting linearity of the swept frequency ranges. Since the gain of the Sawtooth Amplifier V-2 may vary with individual 6V6 tubes, sweep linearity should be checked if this tube is changed.

Procedure: Set the CENTER FREQ. ADJ. pot (R-26) at midpoint of frequency adjustment before starting the alignment and adjustment procedure. Feed the RF OUTPUT from the Rada-Sweep Sr. to the Y-axis input terminals on the scope, through the detector circuit illustrated in Fig. 6-1. To obtain a scope display showing the entire swept range of each band, plus beats indicating band limits, feed through the detector signals from two separate signal generators. One generator should have a frequency range extending above and below the frequency range of the Rada-Sweep Sr.

As an example, assume the Band-Selector is set to a band sweeping from 115 to 185 mc (70 mc sweep width, with center frequency at 150 mc). Since the sweep should be linear over approximately 80% of the swept band, the linear portion to be checked is 56 mc wide. To determine the degree of linearity, set one signal generator to the center frequency of the sweep (150 mc) and the other to 28 mc (half the 56-mc linear portion). A beat should appear at center frequency, plus beats spaced either side of center frequency (122 mc and 178 mc). Now, adjust R-22 for equal spacing of the outer beats with respect to the center-frequency beat, as seen on the scope. The scope controls should be adjusted to establish reference points on the scope calibrated scale. This procedure is repeated for each band position.

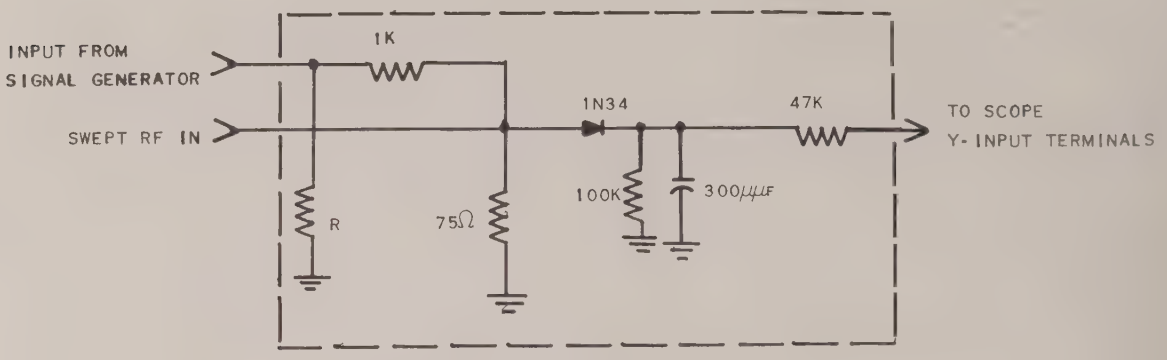


Fig. 6-1, External Detector Circuit.

CONSTRUCTION: ALL COMPONENTS SHOULD BE MOUNTED IN METAL SHIELD AND COMPONENTS PHYSICALLY ISOLATED FROM METAL SIDES TO KEEP STRAY CAPACITANCES LOW. INPUT AND OUTPUT TERMINALS TO BE COMPATIBLE WITH TERMINATIONS ON INTERCONNECTING CABLES. (75 OHM RESISTOR SHOULD BE 50 OHMS FOR UNITS HAVING 50 OHM IMPEDANCE ATTENUATORS AND R SHOULD MATCH THE OUTPUT IMPEDANCE OF THE EXTERNAL SIGNAL GENERATOR.)

(It may be necessary to compromise the setting of R-22 to get good linearity on each band). Signal generator frequencies are determined as related above, remembering that sweep widths are specified as 70% of center frequency between 1 and 100 mc, and 60-70 mc for sweeps between 100 and 260 mc. (Grid dip meters may be substituted for one or both of the signal generators).

Another method requires only an accurate, variable-frequency cw-generator. Reference points are established on the scope calibrated scale. Linearity can be checked as the frequency of the cw-generator is varied to move the beat across the scope display. Frequency readings taken directly from the cw-generator tuning dial will permit calibration of the scope and thus, reflect the degree of linearity of the frequency sweep.

B. Center-Frequency Adjustment.

It is unlikely center frequency for any one of the six switched bands will require adjustment. However, the frequency can be raised or lowered, by spreading or compressing the coil turns of L-2A, L-3A, etc. Spreading the turns will reduce the inductance (raise the frequency), or conversely, compressing the turns will increase the inductance and lower the frequency. Adjustment of the center frequency in this manner may necessitate adjustment of the sweep width and centering resistors.

C. Sweep Width And Centering Adjustments.

Adjustment of sweep width and sweep centering can be accomplished at the same time sweep linearity is being adjusted. However, to avoid complicating the procedure, width and centering adjustments are discussed separately in this section.

Two groups of resistors associated with the sweep generating circuit (R-31 to R-36, sweep width; R-121 to R-126, sweep centering) are selected to maintain centering and sweep width within specifications.

To check sweep width, feed the output of the cw-generator through the detector to the Y-input terminals on the scope. Tune the generator to the center frequency of the band being checked and turn the SWEEP WIDTH control R-14 to maximum (fully clockwise). Now measure sweep width by tuning the signal source until the beat appears at the extreme left of the sweep display. Record this frequency. Then tune the source until the beat is at the extreme right of the sweep. Record this frequency. Subtract the lower frequency from the higher. The result is the sweep width in megacycles, and should be sufficiently wide to meet specifications, as previously referenced.

For example: If center frequency for the band being checked is 60 mc, sweep width should be 70% of this, or 42 mc. Therefore, 60 mc should appear at the center of the sweep, 39 mc at the left, and 81 mc at the right. If sweep width is less than 42 mc, decrease the value of the sweep width resistor until a little more than 42 mc is obtained.

When sweep width is correct, sweep centering should be rechecked. Increasing the value of the centering resistor moves the beat to the left. Centering resistor value may effect the sweep width and a recheck of sweep width should be made after centering is accomplished. This procedure should be repeated for all band positions. If difficulty is encountered in obtaining proper sweep width on all bands, it may be due to insufficient sweep voltage; in which case, selection of a new 6V6 tube for V-2 position may provide the required output.

D. Adjustment Of Sweep Oscillator Output Level And AGC.

Procedure: An r-f signal-generator capable of at least 0.5 volt rms metered output is required. Calibrate the scope for a convenient 0.5 volt reference by setting its Y-axis amplifier for d-c operation, and the signal generator output for 0.5 volt rms. Then feed the signal-generator output into the scope Y-axis through the detector (Fig. 6-1) and adjust the Y-gain control and scope Y-attenuator for vertical references. Now connect the RF OUTPUT from the Rada-Sweep, through the detector, to the Y-input terminals on the scope. Set the RF LEVEL control R-59 to maximum (fully clockwise) with no attenuation inserted (S-3 thru S-7 in OFF position). The agc should be holding the r-f output flat at 0.5 volt or slightly higher.

The output level of the Rada-Sweep Sr. may also be measured directly with a suitable voltmeter. If a voltmeter is used to measure the output, then the junction of D-3 and R-13 should be grounded to remove the blanking signal from the r-f oscillators.

If the r-f output is flat across the entire sweep width but is less than 0.5 volt in amplitude, the grid bias on the agc input stage (V-5) should be adjusted to increase the r-f output. If the r-f level is not flat but is more than 0.5 volt or if the output is flat over part of the sweep and is more than 0.5 volt, R-58 should be increased until the r-f level is reduced to 0.5 volt

and the agc holds across the entire sweep width. If the output is less than 0.5 volt and the agc is not holding, the pick-off loop (L-2B, L-3B, etc.) for the band should be adjusted (the turns spread or compressed) to increase the output to a level where the agc holds. If the agc circuit is overloaded (the output flat, but unresponsive to the RF LEVEL control, or if the agc circuit looses control of the output as the output is reduced with the RF LEVEL control) then a resistor of a value between 2.7K and 12K, just sufficient to prevent overloading, should be soldered directly across the oscillator tank coil (L-2A, L-3A, etc.) for that band.

The RF LEVEL control should provide approximately 6 db variation in the r-f output. If the variation is less than 6 db, decrease R-60; if the variation is more than 6 db, increase R-60.

Trimmer capacitor C-59 furnishes negative feedback in the agc amplifier and adjustment of this control may be used to minimize the spike appearing at the beginning of the sweep.

E. CRYSTAL CIRCUIT ADJUSTMENT.

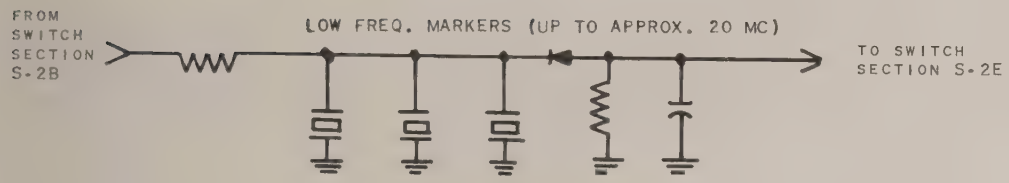
All crystals in the crystal marker circuits are specifically cut to the customer's order. Trimmer capacitors, inductors, resistors, etc., in this circuit are also selected at the plant to furnish frequency markers for each band at specified frequencies; therefore, values have not been assigned to all components in this circuit. It should also be pointed out that these circuits (as shown on the schematic) illustrate the basic concept only and may be modified by insertion of inductors, additional capacitors, resistors, etc., to produce frequency markers as specified by the customer. Fig. 6-2.

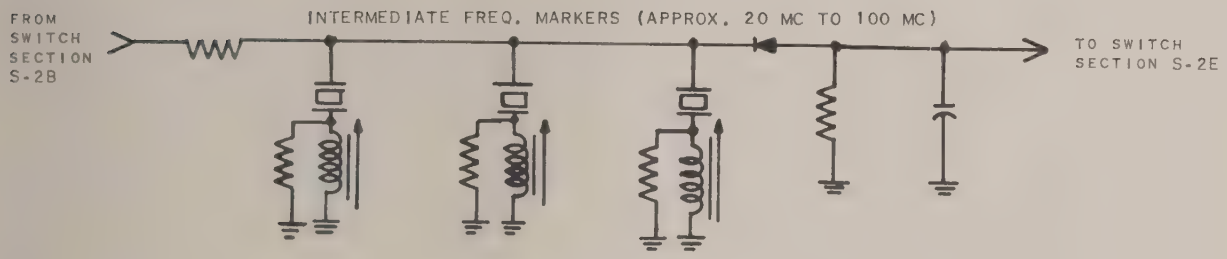
To provide a swept r-f signal of proper amplitude to the marker crystals, trimmer capacitors C-28, C-33, C-38, etc., are adjusted for optimum value. In other crystal marker circuit configurations, inductive or resistive values are adjusted (or selected) to achieve the same result. Fig. 6-2.

Amplitude of the individual markers, as seen on the scope screen, may be adjusted for equal amplitude by tuning the trimmer capacitors which are in series with the individual crystals. In some crystal marker circuits the capacitors are replaced with tunable inductors.

To adjust marker amplitude, remove V-10 from the socket to prevent pips generated here from appearing on the scope screen. Connect the scope to section B grid of V-9. Reduce the pip amplitude with the PIP ADJ control (R-99) to a level where none of the pips are overloading the amplifier; i.e., the level at which all pips reduce equally. Repeat the procedure for each band setting, or as required. Replace V-10.

Internal PIP ADJ control R-114 controls the conduction point of V-10 and is adjusted to produce a full complement of marker pips for each band position when the external PIP ADJ control (R-99) is varied.





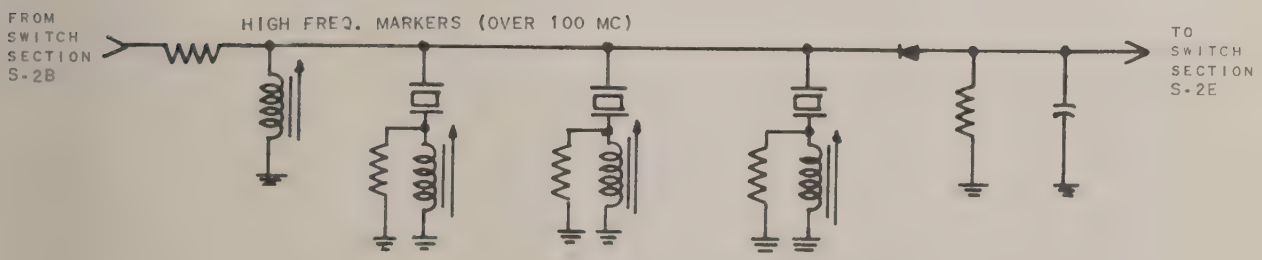


Fig. 6-2, Typical Crystal Marker Circuits.

6-4 RESHIPMENT INSTRUCTIONS.

Permission to return equipment should in every case be obtained from the factory or an accredited Kay representative before return shipment is made.

If it becomes necessary to return the RADA-SWEEP SR. to the factory for repairs, it should be wrapped in protective paper and then adequately padded with soft wadding to cushion the instrument during transit. The wrapped and padded unit should then be packed in a wooden box or suitable carton.

A packing slip should be included in the carton furnishing identification of the shipper. The packing slip should also reference the instrument type and serial number. A statement pertaining to the extent of malfunction should be included to acquaint service personnel with the purpose of returning the instrument.

SECTION VII
LISTING OF REPLACEABLE PARTS

7-1 INTRODUCTION.

To maintain new-instrument performance when repairs are made, use only exact replacement parts, which are obtainable from Kay Electric Company. Reference the instrument type, serial number and circuit symbol number when ordering replacement parts.

All resistors are ½ watt, 10% tolerance, composition type and all capacitor values are in μμf, unless otherwise stated.

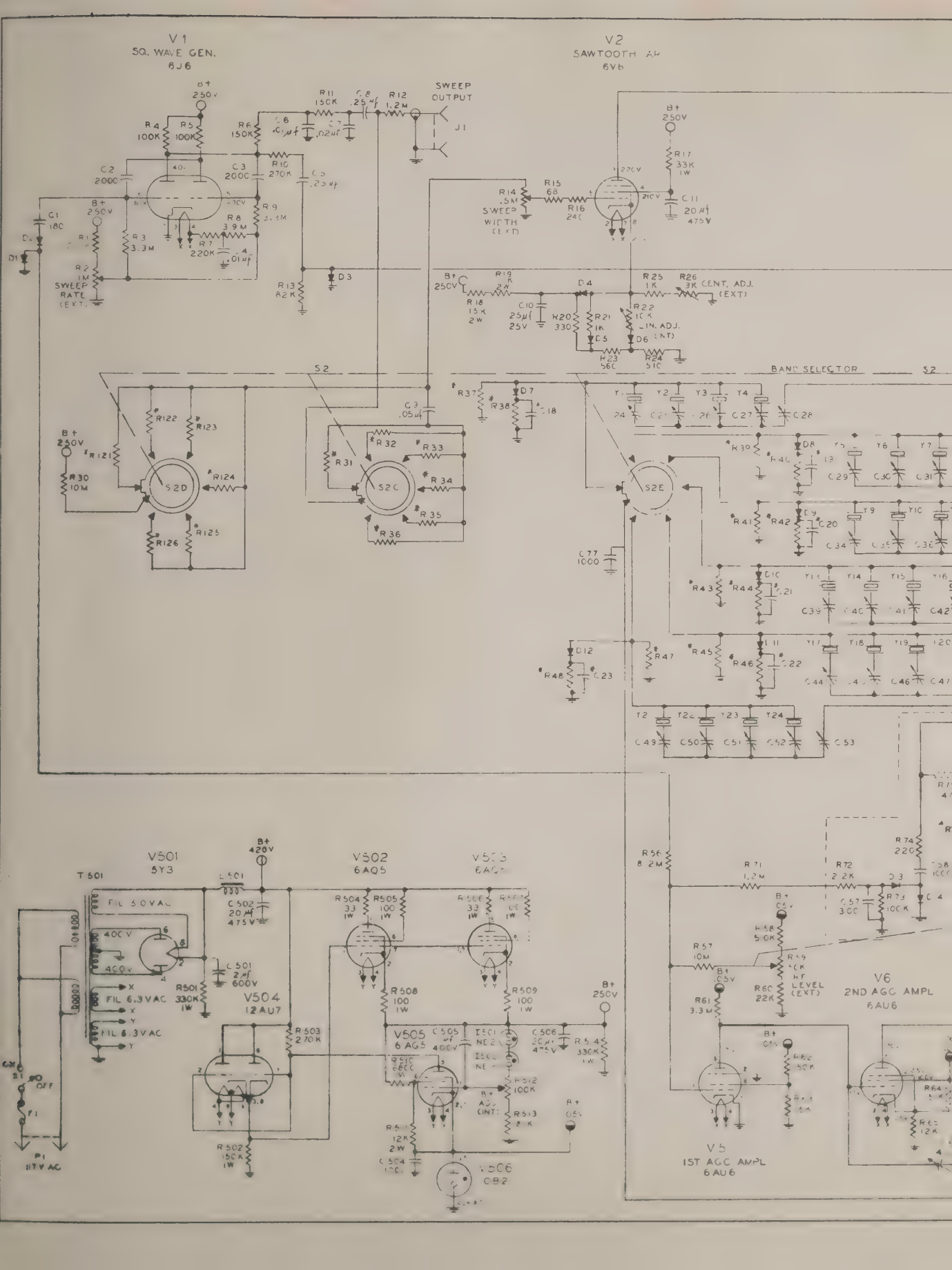
7-2 LISTING OF REPLACEABLE PARTS, Rada-Sweep Sr. (Schematic #KD-5451-B).

DWG. SYMBOL NO.	DESCRIPTION	KAY PART NO.
	CAPACITORS: (ALL CAPACITANCES IN μμF, 500 VOLTS UNLESS OTHERWISE SPECIFIED.)	
C-1	180, SILVER MICA	6359-11
C-2	2000, MICA	6359-34
C-3	2000, MICA	6359-34
C-4	0.01μF, CERAMIC DISC	6360-6
C-5	0.25μF, 400V, PAPER	6353-6
C-6	0.01μF, CERAMIC DISC	6360-6
C-7	0.02μF, CERAMIC DISC	6360-7
C-8	0.25μF, 400V, PAPER (METALITE)	6354-6
C-9	0.05μF, 400V, PAPER (METALITE)	6354-2
C-10	25μF, 25V, ELECTROLYTIC	6355-4
C-11	20μF, 475V, ELECTROLYTIC	6355-8
C-12	NOT USED	
C-13	NOT USED	
C-14	10μμF, CERAMIC (TUBULAR)	6361-28
C-15	10μμF, CERAMIC (TUBULAR)	6361-28
C-16	FACTORY SELECTED	
C-17	500, FEED THRU	6356-1
C-18 THRU C-23	FACTORY SELECTED	
C-24 THRU C-53*	SEE NOTE*	
C-54	0.01μF, CERAMIC DISC	6360-6
C-55	0.01μF, CERAMIC DISC	6360-6
C-56	500μμF, FEED THRU	6356-1
C-57	300, SILVER MICA	6359-17
C-58	1000, CERAMIC (TUBULAR)	6361-25
C-59	4-30, CERAMIC TRIMMER	6358-6
C-60	20μF, 475V, ELECTROLYTIC	6355-8
C-61	0.22μF, 50V, MYLAR	6411-1
C-62	0.22μF, 50V, MYLAR	6411-1
C-63 THRU C-66	1000, CERAMIC (TUBULAR)	6361-25
C-67	500, SILVER MICA	6359-24
C-68	0.22μF, 50V, MYLAR	6411-1
C-69	0.22μF, 50V, MYLAR	6411-1
C-70	33, CERAMIC (TUBULAR)	6361-13
C-71	400, SILVER MICA	6359-21
C-72	390, SILVER MICA	6359-19
C-73	0.02μF, CERAMIC DISC	6360-7
C-74	150, SILVER MICA	6359-10
C-75	500, FEED THRU	6356-1
C-76	500, FEED THRU	6356-1
C-77	1000, CERAMIC (TUBULAR)	6361-25
C-78	0.01μF, CERAMIC DISC	6360-6

* THESE COMPONENTS MAY OR MAY NOT APPEAR IN THE UNIT DEPENDING ON CUSTOMERS CRYSTAL REQUIREMENTS.

DWG. SYMBOL NO.	DESCRIPTION	KAY PART NO.
D-1 THRU D-6	1N294 GERMANIUM DIODE	6357-5
D-7 THRU D-12*	SEE NOTE*	
D-13 AND D-14	G7C GERMANIUM DIODE	6357-4
D-15	1N294 GERMANIUM DIODE	6357-5
F-1	FUSE, 3 AMP, 250V	245
I-1	LIGHT INDICATOR #44	249
J-1	GRC 938A&Z BINDING POST	257
J-2	JACK, UG-185/U	204
J-3	GRC 938 A&Z BINDING POST	257
L-1	SATURABLE REACTOR	4699
L-2 A & B	SPECIAL BAND COIL	L2/5451B
L-3 A & B	" " "	L3/5451B
L-4 A & B	" " "	L4/5451B
L-5 A & B	" " "	L5/5451B
L-6 A & B	" " "	L6/5451B
L-7 A & B	" " "	L7/5451B
L-8 AND L-9	12 MICRO HY FILAMENT CHOKE	6394-1
P-1	AC LINE CORD	328
	RESISTORS: (UNLESS OTHERWISE SPECIFIED, ALL COMPONENTS ARE FIXED COMPOSITION ½ WATT, 10% TOLERANCE RESISTORS.)	
R-1	220 K	2241-E
R-2	0.1 M POT, VARIABLE	121
R-3	3.3 M	3351-E
R-4	100 K	1041-E
R-5	100 K	1041-E
R-6	150 K	1541-E
R-7	220 K	2241-E
R-8	3.9 M	3951-E
R-9	3.3 M	3351-E
R-10	270 K	2741-E
R-11	150 K	1541-E
R-12	1.2 M	1251-E
R-13	82 K	8231-E
R-14	0.5 M POT, VARIABLE	126
R-15	68	6801-E
R-16	240, 5%	2415-E
R-17	33 K, 1 WATT	3331-G
R-18	15 K, 2 WATT	1531-H
R-19	15 K, 2 WATT	1531-H
R-20	330	3311-E
R-21	1 K	1021-E
R-22	10 K POT, VARIABLE	108
R-23	560	5611-E
R-24	510	5111-E
R-25	1 K	1021-E
R-26	3 K, POT, VARIABLE	107
R-27	7.5 K	7521-E
R-28	7.5 K	7521-E
R-29	NOT USED	
R-30	10 M	1061-E
R-31 THRU R-48*	SEE NOTE*	
R-49 THRU R-55	330	3311-E
R-56	8.2 M	8251-E
R-57	10 M	1061-E
R-58	510 K	5141-E
R-59	50K/50K DUAL POT	77
R-60	22 K	2231-E
R-61	3.3 M	3351-E
R-62	150 K	1541-E
R-63	15 K	1531-E

* THESE COMPONENTS MAY OR MAY NOT APPEAR IN THE UNIT DEPENDING ON CUSTOMERS CRYSTAL REQUIREMENTS.


V1
SQ. WAVE GEN.
6J6
V2
SAWTOOTH AMP
6V6
SWEEP OUTPUT
J1
B+ 250V
R4 100K
R5 100K
R6 150K
R11 150K
C8 .25µf
R12 1.2M
C6 .01µf
C7 .02µf
C2 2000
C3 2000
R10 270K
C5 .25µf
R9 3.3M
R8 3.9M
R7 220K
.01µf
C1 180
R1
R3 3.3M
R2 1M SWEEP RATE (EXT.)
D1
D2
D3
R13 82K
R14 .5M SWEEP WIDTH (EXT)
R15 68
R16 24C
C11 20µf 475V
R17 33K 1W
R18 15K 2W
R19 2W
C10 25µf 25V
D4
R20 330
R21 1M
R22 10K LIN. ADJ. (INT)
D5
D6
R23 56C
R24 51C
R25 1K
R26 3K CENT. ADJ. (EXT)
S2
BAND SELECTOR
S2D
S2C
S2E
R121
R122
R123
R124
R125
R126
R30 10M
R31
R32
R33
R34
R35
R36
C3 .05µf
R37
R38
D7
C18
C77 1000
R39
R40
R41
R42
R43
R44
R45
R46
R47
R48
D8
D9
D10
D11
D12
C20
C21
C22
C23
C24
C25
C26
C27
C28
C29
C30
C31
C34
C39
C40
C41
C42
C44
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C47
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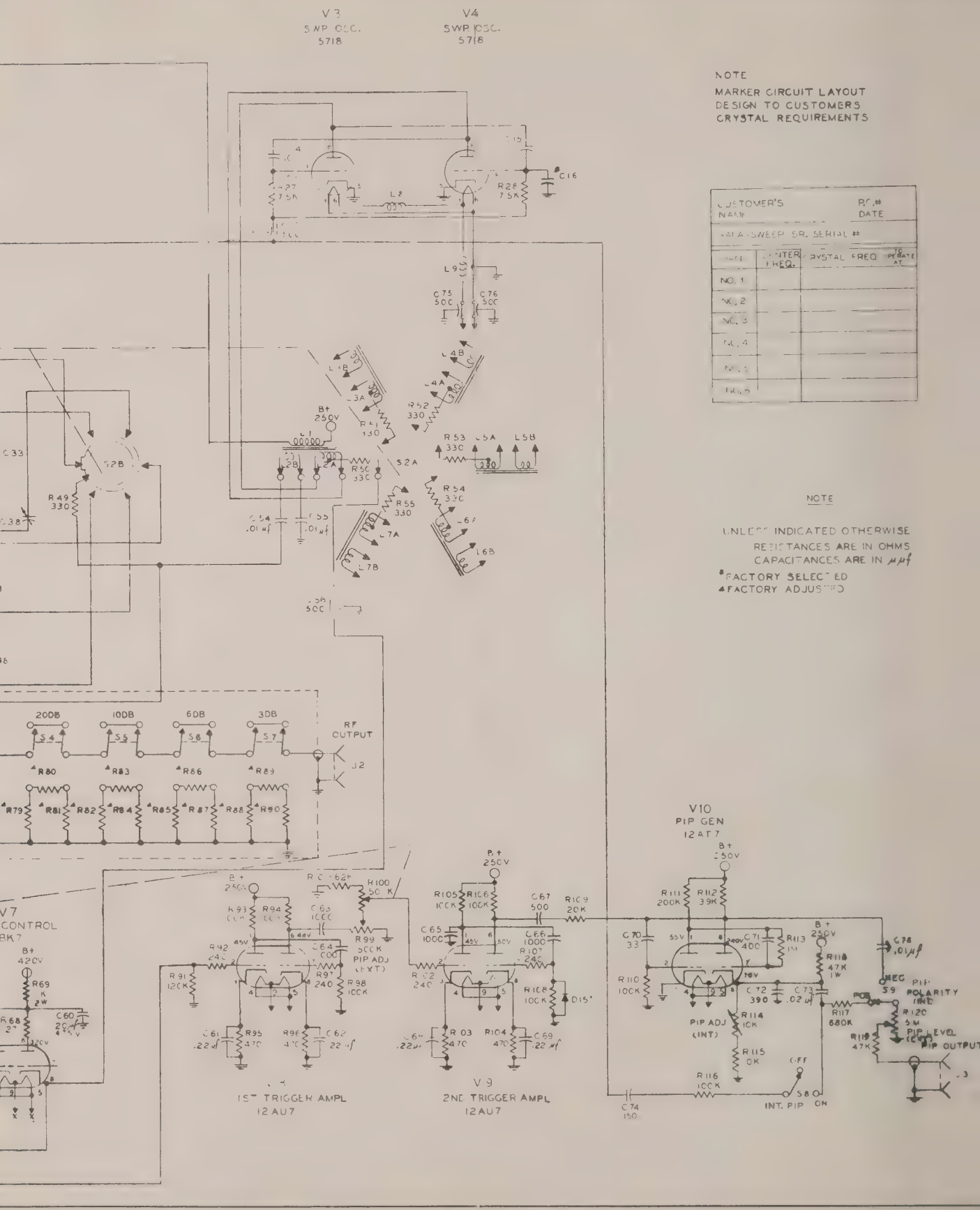
C53
Y1
Y2
Y3
Y4
Y5
Y6
Y7
Y9
Y10
Y13
Y14
Y15
Y16
Y17
Y18
Y19
Y20
Y22
Y23
Y24
T501
V501
5Y3
L501
B+ 420V
C502 20µf 475V
FIL 5.0VAC
400V
400V
C501 2µf 600V
R501 330K 1W
FIL 6.3VAC
X
Y
FIL 6.3VAC
Y
V504
12AU7
R503 270K
R502 150K 1W
ON
OFF
F1
P1
117V AC
V502
6AQ5
R504 33 1W
R505 100 1W
R506 33 1W
R507 100 1W
R508 100 1W
R509 100 1W
V505
6AQ5
C505 .05µf 400V
C506 20µf 475V
R510 33K 1W
R511 100K
R512 100K
R513 8.2K
R514 12M 2W
C504 .1µf
V506
GB2
B+ AGC (INT)
B+ 250V
B+ 65V
R56 8.2M
R71 1.2M
R72 2.2K
R73 100K
R74 220
C57 300
R58 5.0K
R59 10K HF LEVEL (EXT)
R60 22K
R61 3.3M
V6
2ND AGC AMPL
6AU6
V5
1ST AGC AMPL
6AU6


V3
SWP OSC.
5718
V4
SWP OSC.
5718
NOTE
MARKER CIRCUIT LAYOUT
DESIGN TO CUSTOMERS
CRYSTAL REQUIREMENTS
CUSTOMER'S NAME
P.O. #
DATE
AUA SWEEP SR. SERIAL #
CRYSTAL
CENTER FREQ.
CRYSTAL FREQ
TO OPERATE AT
NO. 1
NO. 2
NO. 3
NO. 4
NO. 5
NO. 6
NOTE
UNLESS INDICATED OTHERWISE
RESISTANCES ARE IN OHMS
CAPACITANCES ARE IN μμf
*FACTORY SELECTED
▲FACTORY ADJUSTED
B+ 250V
20DB
10DB
6DB
3DB
RF OUTPUT
J2
S4
S5
S6
S7
R80
R83
R86
R89
R79
R81
R82
R84
R85
R87
R88
R90
V7
CONTROL
B+ 420V
R69
K
2W
C60
20 μf
475V
120V
B+ 250V
R100
50K
C65
1000
C64
.001
PIP ADJ (EXT)
R94
R93
R92
240
R91
120K
R97
240
R98
100K
C61
.22 μf
R95
470
R96
470
C62
.22 μf
1ST TRIGGER AMPL
12AU7
B+ 250V
R105
100K
R106
100K
C67
500
R109
20K
C66
1000
R107
240
R102
240
R108
100K
D15*
C63
.22 μf
R103
470
R104
470
C69
.22 μf
V9
2ND TRIGGER AMPL
12AU7
V10
PIP GEN
12AT7
B+ 250V
R111
200K
R112
39K
C70
33
C71
400
R113
1M
R110
100K
C72
390
C73
.02 μf
R114
10K
PIP ADJ (INT)
R115
OK
R116
100K
C74
150
S8
OFF
ON
INT. PIP
B+ 250V
R118
47K
1W
C78
.01 μf
MEG
PIP
POLARITY (INT)
R117
680K
R119
47K
R120
5M
PIP LEVEL (EXT)
PIP OUTPUT
J3
L1
L2
L3A
L3B
L4A
L4B
L5A
L5B
L6A
L6B
L7A
L7B
L8
L9
R27
75K
R28
75K
C16
C75
50C
C76
50C
R51
330
R52
330
R53
330
R54
330
R55
330
R56
330
S2A
S2B
C54
.01 μf
C55
.01 μf
C33
C38
R49
330
S2B

DWG. SYMBOL NO.	DESCRIPTION	KAY PART NO.
R-64	51 K	5131-E
R-65	12 K	1231-E
R-66	470 K	4741-E
R-67	27	2701-E
R-68	27	2701-E
R-69	1 K, 2 WATT	1021-H
R-70	NOT USED	
R-71	1.2 M	1251-E
R-72	2.2 K	2221-E
R-73	100 K	1041-E
R-74	220	2211-E
R-75	47	4701-E
R-76 THRU R-90	FACTORY ADJUSTED	
R-91	120 K	1241-E
R-92	240, 5%	2415-E
R-93	100 K	1041-E
R-94	100 K	1041-E
R-95	470	4711-E
R-96	470	4711-E
R-97	240, 5%	2415-E
R-98	100 K	1041-E
R-99	500 K, POT, VARIABLE	126
R-100	50K/50K DUAL POT	77
R-101	62 K	6231-E
R-102	240, 5%	2415-E
R-103	470	4711-E
R-104	470	4711-E
R-105	100 K	1041-E
R-106	100 K	1041-E
R-107	240, 5%	2415-E
R-108	100 K	1041-E
R-109	20 K	2031-E
R-110	100 K	1041-E
R-111	200 K	2041-E
R-112	39 K	3931-E
R-113	1 M	1051-E
R-114	10 K, POT, VARIABLE	108
R-115	10 K	1031-E
R-116	100 K	1041-E
R-117	680 K	6841-E
R-118	47 K, 1 WATT	4731-G
R-119	47 K	4731-E
R-120	0.5 M POT, VARIABLE	126
R-121 THRU R-126	FACTORY SELECTED	
S-1	SWITCH, SPST	255-C
S-2A THRU S-2E	SWITCH, ROTARY (INCLUDING COMPONENTS)	5382
S-3 THRU S-7	SWITCH, DPDT (TEFLON)	254T
S-8	SWITCH, DPDT	254-C
S-9	SWITCH, DPDT	254-C
V-1	TUBE, 6J6	6J6
V-2	" 6V6	6V6
V-3	" 5718	5718
V-4	" 5718	5718
V-5	" 6AU6	6AU6
V-6	" 6AU6	6AU6
V-7	" 6BK7	6BK7
V-8	" 12AU7	12AU7
V-9	" 12AU7	12AU7
V-10	" 12AT7	12AT7
Y-1 THRU Y-24	CRYSTAL, QUARTZ	
	ATTENUATOR ASSEMBLY	5381

7-4 ADDENDA.

All RADA-SWEEP SR'S above serial number 21478 are assembled in accordance with Schematic #KD-5451-E. Examination of this schematic will show that certain refinements have been made to the Square-wave Generator (V-1), the Sawtooth Amplifier (V-2), the AGC circuit (V-6) and to the circuits associated with these tubes. Two of the refinements involve variable components and will be discussed here, since they effect adjustment of the instrument.

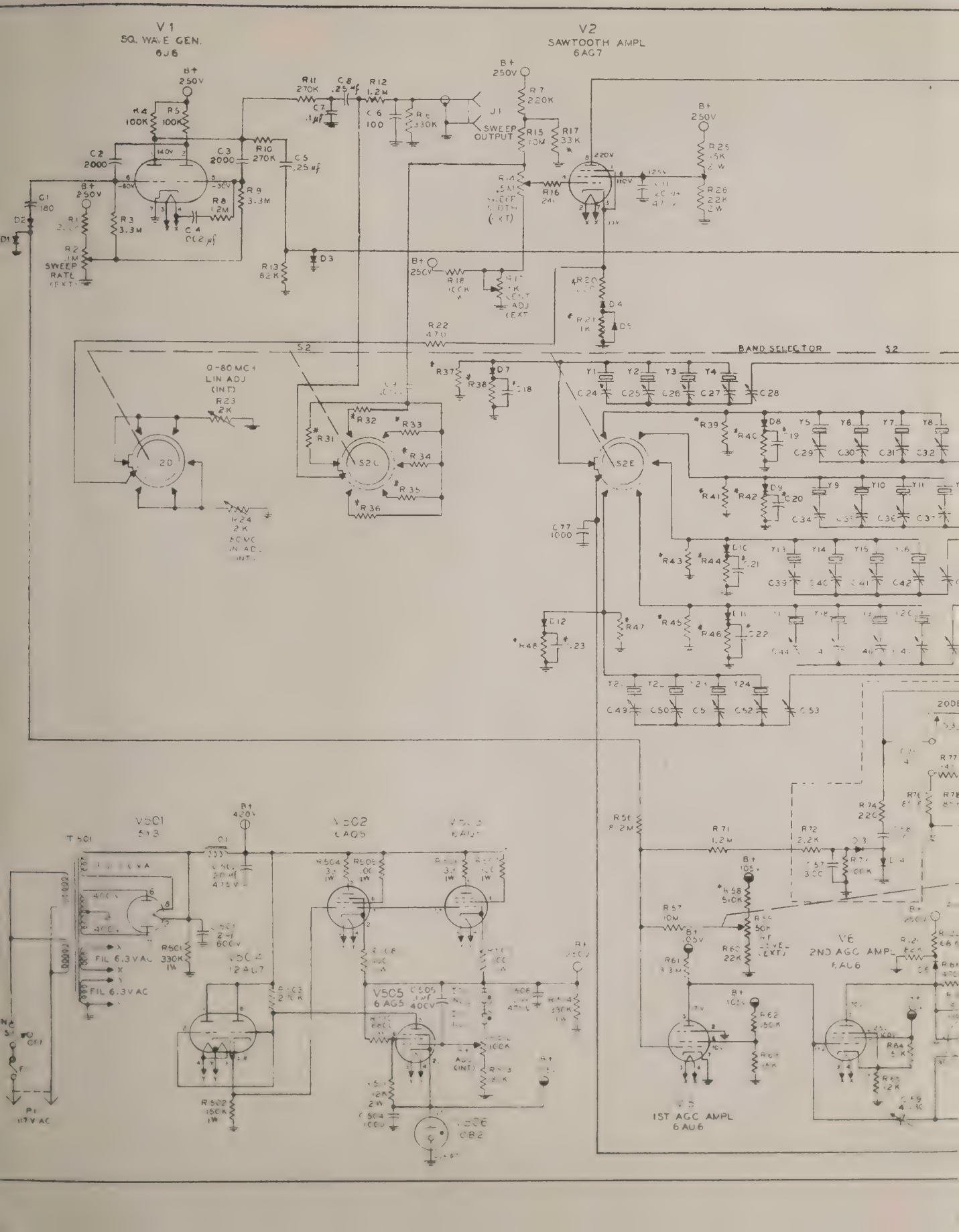
A. In this version of the RADA-SWEEP SR. the 6V6 Sawtooth Amplifier (V-2) has been replaced with a type 6AG7 tube. The cathode circuit has been modified to include two Zener diodes and the Centering control, which was in the cathode circuit, is now located in the grid circuit.

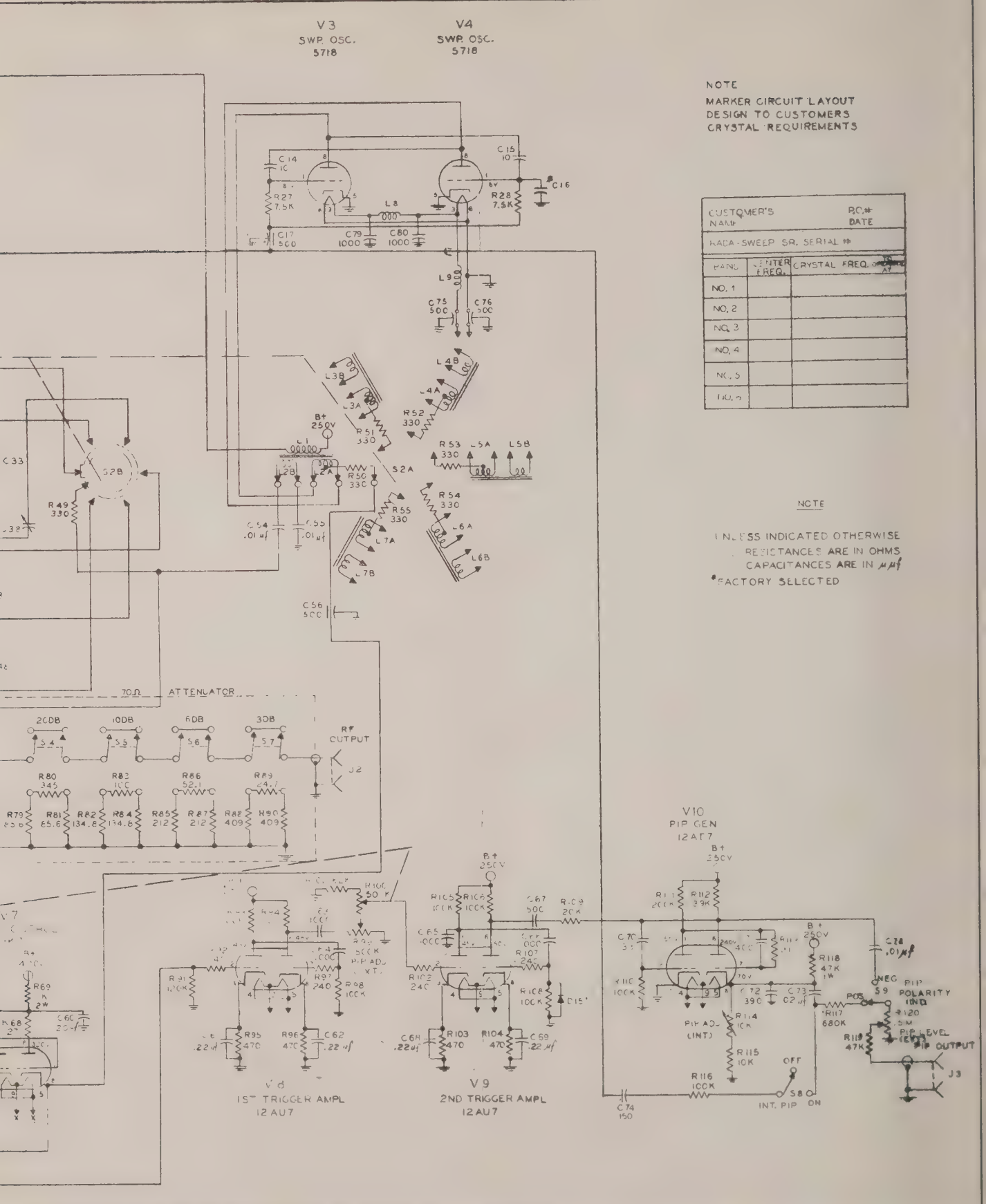
The Zener diodes perform the same function as was accomplished by diodes D-4, D-5 and D-6 in the original version. (See Section 5-2, B).

B. The Linearity control which was in the cathode circuit (R-22) is now replaced by two linearity controls (R-23, R-24), referred to on Schematic KD-5451-E as the 0-80 mc LIN ADJ and 80 mc+ LIN ADJ controls respectively. The individual controls are switched into the cathode circuit of V-2 when the Band Selector switch is rotated.

Adjustment of these potentiometers is similar to the procedure given in Section 6-3, A. The individual linearity controls replace the fixed resistors R-121 thru R-126.

C. A diode limiter has been added to the plate circuit of the 2nd AGC Amplifier (V-6). This diode prevents the plate voltage of the sweeping oscillator (V-3, V-4) from rising to levels which may be harmful during the retrace or blanked portion of the sweep.


V1
SQ. WAVE GEN.
6J6
V2
SAWTOOTH AMPL
6AG7
B+ 250V
R11 270K
C8 .25 µf
R12 1.2M
C7 .1 µf
C6 100
R6 330K
J1
SWEEP OUTPUT
R7 220K
R15 10M
R17 33K
R4 100K
R5 100K
C2 2000
C3 2000
R10 270K
C5 .25 µf
R9 3.3M
R8 1.2M
C4 .002 µf
C1 180
D2
D1
R1
R2 1M
SWEEP RATE (EXT)
R3 3.3M
R13 82K
D3
R14 .5M
R16 24K
R18 100K
R19 1K
R20
D4
R21 1K
D5
R22 470
R25 1.5K 2W
R26 22K 2W
S2
BAND SELECTOR
S2
0-80 MC+ LIN ADJ (INT)
R23 2K
2D
S2C
S2E
R24 2K 80 MC LIN ADJ (INT)
R31
R32
R33
R34
R35
R36
R37
D7
R38
C18
C24
C25
C26
C27
C28
Y1
Y2
Y3
Y4
R39
R40
D8
C29
C30
C31
C32
Y5
Y6
Y7
Y8
R41
R42
D9
C20
C34
C36
Y9
Y10
Y11
C77 1000
R43
R44
D10
C39
C40
C41
C42
C12
R47
R45
R46
D11
C22
R48
C43
C50
C53
T501
V501 5Y3
B+ 420V
C1
C501 20 µf 475 V
V502 6AQ5
V504 12AU7
V505 6AG5
C505 .1 µf 400V
V506 CB2
R501 330K 1W
R502 150K 1W
R503 2.2K
R504 3.3K 1W
R505 100 1W
R506 3.3K 1W
R507 100 1W
R508 100K
R509 12K 2W
C504 100 µf
FIL 6.3 VAC
FIL 6.3 VAC
P1 117 V AC
OFF
R56 2.2M
R71 1.2M
R72 2.2K
R74 220
R77
R78
C57 300
R57 10M
R58 510K
R59 50K
R60 22K
R61 3.3M
V6
2ND AGC AMPL
6AU6
R62 150K
R63 1M
R64 5K
R65 2K
V5
1ST AGC AMPL
6AU6



AUA Serial No. 21478

Fig. 7-5, Schematic KD-5451-E, Rada-Sweep Sr. 31, 32

7-6 LISTING OF REPLACEABLE PARTS, Rada-Sweep Sr. (Per Schematic #KD-5451-E).

Components used in the assembly of this version of the RADA-SWEEP SR. are identical to those used in the earlier version (Schematic KD-5451-B), except for the components listed below:

DWG. SYMBOL NO.	DESCRIPTION	KAY PART NO.
C-4	0.002μF, 600V, MYLAR - PAPER	6899-4
C-5	0.25μF, 400V, MYLAR - PAPER	6899-3
C-6	100μμF, SILVER MICA	6359-46
C-7	0.1μF, 400V, MYLAR - PAPER	6899-2
C-8	0.25μF, 400V, MYLAR - PAPER	6899-3
C-9	0.05μF, 100V, MYLAR - PAPER	6899-1
C-10	NOT USED	
C-79	1000μμF, 75V, CERAMIC DISC	6360-1
C-80	1000μμF, 75V, CERAMIC DISC	6360-1
D-1 THRU D-3	1N294 GERMANIUM DIODE	6357-5
D-4 AND D-5	MEZ 5:6 T10 ZENER DIODE	6357-17
D-6	1N538 SILICON RECTIFIER	6357-14
L-2 A & B	BAND COIL, SPECIAL	L2/5451-D
L-3 A & B	" " "	L3/5451-D
L-4 A & B	" " "	L4/5451-D
L-5 A & B	" " "	L5/5451-D
L-6 A & B	" " "	L6/5451-D
L-7 A & B	" " "	L7/5451-D
R-6	330 K	3341-E
R-8	1.2 M	1251-E
R-15	10 M	1061-E
R-17	33 K	3331-E
R-18	100 K, 1 WATT	1011-G
R-19	3 K, 2 WATT, POT, VARIABLE	107
R-20	220	2211-E
R-22	470	4711-E
R-23	2K, 2 WATT, POT, VARIABLE	105
R-24	2K, 2 WATT, POT, VARIABLE	105
R-25	15 K, 2 WATT	1531-H
R-26	22 K, 2 WATT	2231-H
R-30	NOT USED	
R-77 THRU R-90	SEE CHART FOR 50, 70, 90 OHM ATTENUATORS	
R-121	82 K	8231-E
R-122	68 K	6811-E
R-123 THRU R-126	NOT USED	
V-?	TUBE, 6AG7	6AG7

7-7 LISTING OF REPLACEABLE PARTS, 50, 70 & 90 OHM ATTENUATORS.

RADA-SWEEP SR. ATTENUATORS CHART

No.	50 OHM		70 OHM		90 OHM	
	Value	Kay No.	Value	Kay No.	Value	Kay No.
R-76	65.4	6558-21	85.6	6558-25	110	6558-28
R-77	264	6558-37	345	6558-41	446	6558-44
R-78	65.4	6558-21	85.6	6558-25	110	6558-28
R-79	65.4	6558-21	85.6	6558-25	110	6558-28
R-80	264	6558-37	345	6558-41	446	6558-44
R-81	65.4	6558-21	85.6	6558-25	110	6558-28
R-82	103	6558-27	134.8	6558-31	173	6558-32
R-83	76.4	6558-24	1.00	6558-26	128	6558-30
R-84	103	6558-27	134.8	6558-31	173	6558-32
R-85	150.2	6558-59	212	6558-35	271	6558-38
R-86	37.4	6558-58	52.1	6558-18	67.2	6558-22
R-87	150.2	6558-59	212	6558-35	271	6558-38
R-88	313	6558-39	409	6558-42	526	6558-46
R-89	18.9	6558-10	24.7	6558-13	31.7	6558-14
R-90	313	6558-39	409	6558-41	526	6558-46

7-8 LISTING OF REPLACEABLE PARTS, POWER SUPPLY SECTION.

DWG. SYMBOL NO.	DESCRIPTION	KAY PART NO.
	CAPACITORS:	
C-501	2μF, 600V, BATH TUB	1748
C-502	20μF, 475V, 4 SECTION ELECTROLYTIC	6355-8
C-503	0.01μF, 500V, CERAMIC DISC	6360-7
C-504	1000μμF, CERAMIC (TUBULAR)	6361-25
C-505	0.1μF, 400V, PAPER	6353-4
C-506	20μF, 475V, 4 SECTION ELECTROLYTIC	6355-8
I-501	NEON LIGHT NE2	NE2
I-502	NEON LIGHT NE2	NE2
L-501	CHOKE C-1709 (8 HY)	4723
R-501	330 K, 1 WATT ±10%	3341-G
R-502	150 K, 1 WATT ±10%	1541-G
R-503	270 K, ½ WATT ±10%	2741-E
R-504	33, 1 WATT ±10%	3301-G
R-505	100, 1 WATT, ±10%	1011-G
R-506	33, 1 WATT ±10%	3301-G
R-507	100, 1 WATT ±10%	1011-G
R-508	100, 1 WATT ±10%	1011-G
R-509	100, 1 WATT ±10%	1011-G
R-510	6.8 K, 1 WATT ±10%	6821-G
R-511	12 K, 2 WATT ±10%	1231-H
R-512	100 K, POT, VARIABLE	121
R-513	180 K, ½ WATT ±10%	1841-E
R-514	330 K, 1 WATT ±10%	3341-G
T-501	TRANSFORMER (POWER)	321
V-501	TUBE, 5Y3	5Y3
V-502	" 6AQ5	6AQ5
V-503	" 6AQ5	6AQ5
V-504	" 12AU7	12AU7
V-505	" 6AG5	6AG5
V-506	" OB2	OB2

RADA-SWEEP SR. ADDENDUM

Ref: Schematic Diagram KD-5451-H. February, 1962

This addendum covers all units after Serial No. 22006.

Ref: Fig. 7-5. Schematic KD-5451-E has been superceded by KD-5451-H.

Ref: Fig. 7-5 (Schematic KD-5451-E), Pin 1 of the sawtooth amplifier (V-2) has been grounded as shown on the later schematic (KD-5451-H).

Ref: Section 7-2, page 26. R-6 has been changed from 330 K ohms to 1 meg ohm.

Ref: Section 6-3E, page 22 (Crystal Circuit Adjustment). The sequence of adjustments is incomplete and the steps are not in proper sequence. Paragraphs 2 through 5 of that section are restated here. The first paragraph is correct as it appears on page 22.

To adjust the amplitude of the triggers appearing at the output of the 2nd trigger amplifier, connect the scope to pin 7 of V-9. Remove V-10 from the socket to prevent pips generated here from appearing on the scope screen. Reduce the pip amplitude with the PIP ADJ control (R-99), to a level where none of the pips are overloading the amplifier; i.e., the level at which all pips reduce in amplitude at the same rate.

The amplitude of the individual triggers on any one band, as seen on the scope screen, may be adjusted for equal amplitude by tuning the variable inductors associated with each crystal or by adjusting the value of the damping resistor across each inductor. Fig. 6-2b and c. The amplitude of an individual trigger produced in a marker circuit similar to that shown in Fig. 6-2a, may be reduced by adding a suitable resistor in series with the crystal.

The value of the resistor in series with the r-f input to the crystal bank may be selected so that triggers produced by each crystal bank are approximately equal from band to band. In some crystal marker circuits the resistors are replaced by capacitors.

After repeating this procedure for each of the six bands, replace V-10 and remove the scope connection from pin 7 of V-9.

To check the final adjustment of the internal PIP ADJ control R-114, provide a connection between the SWEEP OUT terminals and the X-axis input terminals on the scope. Provide another connection between the RF OUT and PIP OUT terminals to the Y-axis input on the scope. The detector and resistor shown in Notes B and C in Fig. 2-1 should be connected as shown.

Set the front panel PIP ADJ control (R-99) to mid-range. Now adjust the internal PIP ADJ control R-114 until V-10 is in the free-running stage (multiple, uncontrolled pips appear on the scope screen). Back off from this adjustment to a point just below the free-running condition, where a full complement of pips appear. Make a slight re-adjustment of R-114 to achieve a position which affords the greatest amount of variation of the panel PIP ADJ control between the limits of disappearing pips and multiple pips.

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